

COMPARISON OF STRATEGY OPTIONS  
TECHNICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIAL (TENORM)  
RESIDENTIAL AREAS OVERLYING PHOSPHATE MINED LANDS  
WEST-CENTRAL FLORIDA  
June 2006

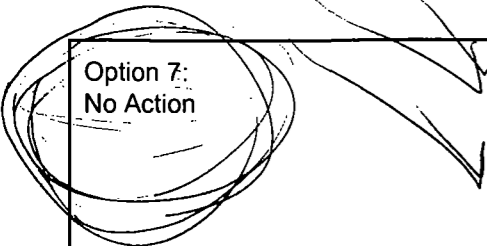
Potential Options <sup>1,2</sup>	Description <sup>3</sup>	Pros <sup>3,4</sup>	Cons
Option 1: CERCLA Response, No Prioritization	Use of UMTRCA ARAR of 5 pCi/g above background for Ra <sup>226</sup> as threshold for action and as cleanup level. <ul style="list-style-type: none"><li>Residential lots with an average Ra<sup>226</sup> soil concentration greater than 6 pCi/g (5 pCi/g plus background) would trigger a response action.</li><li>Soil contaminant levels reduced to at least 6 pCi/g through soil removal and replacement.</li><li>Contaminated soil disposed of locally at a non-radioactive waste disposal facility.</li><li>Residents relocated, as needed, during cleanup.</li></ul>	Compliant with CERCLA, NCP, OSWER guidance, and other radiation related CERCLA response actions.  Likely supported by ATSDR.	Would require traditional Superfund approach (i.e., soil removal, soil cover, relocation).  Most disruptive to people living in area in near term.  Likely opposed by State of Florida.
Option 2: CERCLA Response & Contaminant Level Prioritization  $\left. \begin{matrix} 10^{-2} \\ 10^{-2} - 10^{-3} \\ 10^{-3} - 10^{-4} \end{matrix} \right\}$	Response actions would focus on areas with the highest contaminant levels first, eventually working through all areas that exceed the 5 pCi/g above background as funding allows. <ul style="list-style-type: none"><li>Response work prioritized based on three risk-based categorizes of Ra<sup>226</sup> contaminant levels in soil. For example, greater than <math>1 \times 10^{-2}</math> (124 pCi/g); <math>1 \times 10^{-3}</math> (12 pCi/g) to <math>1 \times 10^{-2}</math> (124 pCi/g); and less than <math>1 \times 10^{-3}</math> (12 pCi/g).</li><li>Response actions would be conducted at residences in the greater than 124 pCi/g first; followed by the 12 to 124 pCi/g next; followed by the less than 12 pCi/g to 6 pCi/g (background) last.</li><li>Once initiated, response actions would be conducted using the same approach as "Option 1: CERCLA Response with no Prioritization".</li><li>The risk level used for prioritization may be established after the extent of contamination is determined.</li></ul>	Compliant with CERCLA, NCP, OSWER Guidance, and other radiation related CERCLA response actions.  Allows funding and resources to be budget over many years.  Likely supported by ATSDR.	Would require traditional Superfund approach (i.e., soil removal, soil cover, relocation).  Likely opposed by State of Florida.
Option 3: CERCLA Response & Minimum Threshold Site Determination Level	A minimum contaminant level would be used in the screening of sites to identify areas that may require a CERCLA response as outlined in Option 1. Areas that did not exceed a minimum average contaminant level would be "screened-out" as a possible site. <ul style="list-style-type: none"><li>In an effort to balance cost with risk reduction and other socio-economic considerations, a minimum contaminant level would be established that must be exceeded in order to establish a CERCLA site.</li><li>A contaminant level of <math>1 \times 10^{-3}</math> (12 pCi/g) above background of Ra<sup>226</sup> would be used as the threshold value to establish a site.</li><li>Areas with contaminant levels below 12 pCi/g would not be identified as a site with respect to radiation risks.</li><li>Areas with an average Ra<sup>226</sup> soil contaminant level greater than 12 pCi/g above background would be identified as a site for further consideration for reduction in risk to human health from radiation using the criteria in Option 1: CERCLA Response, No Prioritization.</li></ul>	Consistent with CERCLA and NCP.  Focuses resources on areas that will achieve the greatest degree of reduction in risk.  Actually reduces "universe of sites" for Option 1: CERCLA Response with no Prioritization.  Much less costly than Option 1 cleanup.  Likely supported by ATSDR.  Acceptance of approach by State more likely.  Based on current information, this approach would be expected to significantly (i.e., 50%) reduce the "universe of sites" that would require an Option 1 cleanup.	May raise precedent/consistency with other radiation related CERCLA response actions.  OSRTI concerned that Stakeholders may view this the establishment of a $10^{-3}$ risk level as a new "trigger" for taking remedial action.  <div>elect waste stream</div> Giant Political Problem  $10^{-4} - 10^{-6}$ is generally the new

\* acute risk



Option 4: FDOH Paradigm <sup>6</sup>	<p>FDOH proposed a tiered approach to taking response actions.</p> <ul style="list-style-type: none"> <li>No action would be conducted at residences with dose levels less than 100 mRem/yr (17 pCi/g).</li> <li>Residents with dose levels at their property between 100 (17 pCi/g) and 500 mRem/yr (85 pCi/g) would be educated about radiation and ways to reduce risks and exposures.</li> <li>Cleanups using Option 1: CERCLA Response with no Prioritization would be conducted by EPA at properties with dose levels that exceed a dose level of 500 mRem/yr (85 pCi/g).</li> </ul>	<p>Greatly reduces universe of potential sites. Very few areas expected to have dose levels in excess of 500 mRem/yr.</p> <p>Consistent with response conducted pursuant to RCRA 3008 action at slag site in Pocatello, ID and with Austin Avenue, Landsdowne, PA site. However, these actions pre-date, and are inconsistent with current CERCLA guidance.</p> <p>Supported by ATSDR and State of Florida.</p>	<p>Not consistent with CERCLA, the NCP nor OSWER guidance.</p> <p>Would raise significant precedent /consistency issues with other radiation related CERCLA response actions and possibly other chemical carcinogens. Stakeholders may assume that 10<sup>-3</sup> is EPA's new "trigger" for taking a response action.</p>
Option 5: State Deferral/"Other Clean-up Authority"	<p>Defer sites to the State of Florida for Response.</p> <ul style="list-style-type: none"> <li>Sites currently in CERCLIS would be deferred to the State for assessment and possible response action.</li> <li>Radiation issues associated with CERCLIS sites and other areas would be the responsibility of the State to address.</li> </ul>	<p>Likely removes the majority of sites from EPA's area of responsibility.</p>	<p>Based on discussions with FDEP, Office of the Secretary, the State of Florida may not want the sites back. (State does not want to be in a position of publically having to respond as to why it is not addressing sites using the Federal ARAR or that is equally protective.)</p> <p>Neither FDOH nor FDEP currently have regulations in place could address risks to human health from exposure to TENORM exposures.</p> <p>Support by ATSDR uncertain.</p> <p>EPA would be faced with approving of the deferral of sites to a State that currently has no formal program to address the sites to achieve an equivalent level of protection as would EPA.</p> <p>Sites already in CERCLIS, would remain in CERCLIS with an "Other Cleanup Authority" code.</p>
Option 6: State Re-Assessment	<p>Refer CERCLIS sites back to State of Florida for re-evaluation.</p> <ul style="list-style-type: none"> <li>Most phosphate sites have discovery dates that pre-date CERCLA.</li> <li>Current phosphate sites in CERCLIS believed to have come from a RCRA database that was used to "front-load" CERCLIS in with the enactment of CERCLA.</li> <li>Based on unique circumstances for site discovery, phosphate related mining sites could be referred back to the State of Florida for review and evaluation through the current pre-remedial process.</li> <li>EPA would use Option 1: CERCLA Response with no Prioritization for sites identified by State and warranting a CERCLA response.</li> <li>This same approach could be applied to residential areas not yet identified with a CERCLIS site.</li> </ul>	<p>All sites initially removed from CERCLIS.</p>	<p>Ultimate determination made by State regarding site status and which sites, if any, could be referred to EPA is unknown. State radiation policy could change with time due to public input.</p> <p>Based on discussions with FDEP, Office of the Secretary, the State of Florida may not want the sites back.</p> <p>Support by ATSDR uncertain.</p>

Would NCP change?

 Option 7: No Action	Take no further action on phosphate sites in CERCLIS based on potential radiological risks.  Maintain current status of sites in CERCLIS as "low-priority" or "archived" based on chemical-based risks.	Would likely be supported by State.	Not consistent with CERCLA, NCP, and OSWER guidance since "No Action" assumes risk level within CERCLA risk range of $10^{-4}$ to $10^{-6}$ .  Would raise significant precedent/consistency issues with other radiation related CERCLA response actions and possibly other chemical carcinogens.  Vulnerable to public, GAO or OIG criticism.  Support by ATSDR uncertain.
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Notes:

- 1) Options involving an EPA response are based on the assumption that areas with elevated levels of radiation and Ra<sup>226</sup> had been adequately delineated. Based on the review applicability of various technologies, it is assumed that the assessment would have been conducted using an aerial based survey followed by ground-based confirmation.
- 2) All options listed are designed to address risks to human health in areas where residential exposure are occurring or expected to occur in the future. Future potential risks to human health in areas not yet developed would be expected to be managed through the use of institutional controls.
- 3) The reaction by industry, the public, and local governments are also a consideration in identifying and evaluating the "pros" and "cons" of various options. They were not evaluated here because of the expected variability in responses to the options. For example, some home owners may not be overly concerned about the potential radiation risk, but greatly concerned about the impact on their real estate value. Local counties that have been mined would be expected to have a different reaction to counties where future mining is planned.
- 4) A common factor that relates to all of the options are potential "Environmental Justice" considerations. Based on an initial review of the demographics, its anticipated that there will be variations in income status and ethnic backgrounds which will likely need to be considered for any option.
- 5) 124 pCi/g of Ra<sup>226</sup> in soil under a residential scenario is estimated to result in long-term cancer risk of  $1 \times 10^{-2}$ . 12 pCi/g is approximately equivalent to  $1 \times 10^{-3}$  chronic risk level.
- 6) Option 6: FDOH paradigm is based on a recommendation by FDOH to EPA. FDOH reportedly based it on recommendations from the NCRP. NCRP, however, recommends 100 mRem/yr for frequent exposures vs. 500 mRem/yr. Based on conversations with FDOH staff, their preliminary modeling estimates for Ra<sup>226</sup> contamination with residential land use would be 17 pCi/g for 100 mRem/yr and 85 pCi/g for 500 mRem/yr.